Name _____ Date _____

Essential Question How can you determine the number of solutions of a quadratic equation of the form $ax^2 + c = 0$?

1 **EXPLORATION:** The Number of Solutions of $ax^2 + c = 0$
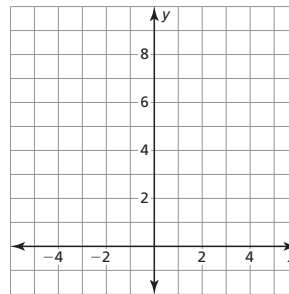
Go to *BigIdeasMath.com* **for an interactive tool to investigate this exploration.**

Work with a partner. Solve each equation by graphing. Explain how the number of solutions of $ax^2 + c = 0$ relates to the graph of $y = ax^2 + c$.
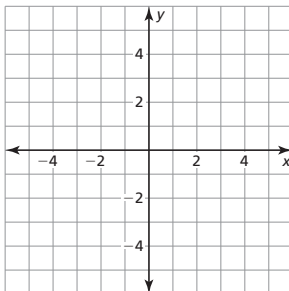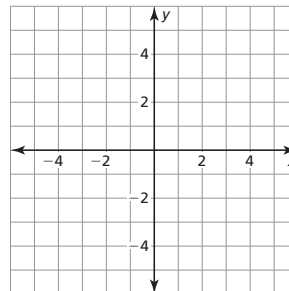
a. $x^2 - 4 = 0$
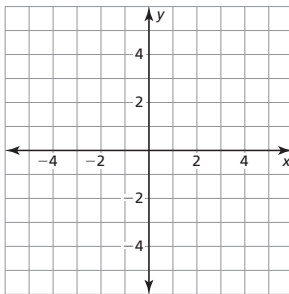
b. $2x^2 + 5 = 0$

c. $x^2 = 0$

d. $x^2 - 5 = 0$

2 **EXPLORATION:** Estimating Solutions

Work with a partner. Complete each table. Use the completed tables to estimate the solutions of $x^2 - 5 = 0$. Explain your reasoning.

a.

x	$x^2 - 5$
2.21	
2.22	
2.23	
2.24	
2.25	
2.26	

b.

x	$x^2 - 5$
−2.21	
−2.22	
−2.23	
−2.24	
−2.25	
−2.26	

9.3   **Solving Quadratic Equations Using Square Roots** (continued)

3   **EXPLORATION:** Using Technology to Estimate Solutions

Work with a partner. Two equations are equivalent when they have the same solutions.

a. Are the equations $x^2 - 5 = 0$ and $x^2 = 5$ equivalent? Explain your reasoning.

b. Use the square root key on a calculator to estimate the solutions of $x^2 - 5 = 0$. Describe the accuracy of your estimates in Exploration 2.

c. Write the exact solutions of $x^2 - 5 = 0$.

Communicate Your Answer

4. How can you determine the number of solutions of a quadratic equation of the form $ax^2 + c = 0$?

5. Write the exact solutions of each equation. Then use a calculator to estimate the solutions.

a. $x^2 - 2 = 0$

b. $3x^2 - 18 = 0$

c. $x^2 = 8$

9.3 **Notetaking with Vocabulary**
For use after Lesson 9.3

In your own words, write the meaning of each vocabulary term.

square root

zero of a function

Core Concepts

Solutions of $x^2 = d$

- When $d > 0$, $x^2 = d$ has two real solutions, $x = \pm\sqrt{d}$.

- When $d = 0$, $x^2 = d$ has one real solution, $x = 0$.

- When $d < 0$, $x^2 = d$ has no real solutions.

Notes:

9.3 **Notetaking with Vocabulary** (continued)

Extra Practice

In Exercises 1–18, solve the equation using square roots.

1. $x^2 + 49 = 0$

2. $x^2 - 25 = 0$

3. $x^2 + 6 = 6$

4. $2x^2 + 84 = 0$

5. $2x^2 - 72 = 0$

6. $-x^2 - 12 = -12$

7. $8x^2 - 49 = 151$

8. $-3x^2 + 16 = -11$

9. $81x^2 - 49 = -24$

10. $16x^2 - 1 = 0$

11. $25x^2 + 9 = 0$

12. $16 - 2x^2 = 16$

13. $(x - 4)^2 = 0$

14. $(x + 2)^2 = 196$

15. $(2x + 7)^2 = 49$

9.3 **Notetaking with Vocabulary** (continued)

16. $16(x - 3)^2 = 25$ **17.** $81(3x + 1)^2 = 49$ **18.** $(4x - 3)^2 = 64$

In Exercises 19–24, solve the equation using square roots. Round your solutions to the nearest hundredth.

19. $x^2 + 6 = 8$ **20.** $x^2 - 12 = 3$ **21.** $x^2 + 25 = 49$

22. $3x^2 - 4 = 14$ **23.** $6x^2 + 5 = 20$ **24.** $20 - 4x^2 = 18$

25. A ball is dropped from a window at a height of 81 feet. The function $h = -16x^2 + 81$ represents the height (in feet) of the ball after x seconds. How long does it take for the ball to hit the ground?

26. The volume of a cone with height h and radius r is given by the formula $V = \dfrac{1}{3}\pi r^2 h$. Solve the formula for r. Then find the radius of a cone with volume 27π cubic inches and height 4 inches.